MECHANICAL ARCHITECTURE FOR DISPLAY KEYBOARD KEYS

BACKGROUND

[0001] The most popular input device is the keyboard, keypad, or the like, which is employed on cell phone, PDAs, portable computers, and desktop computer, for example. The key button is stamped with alphabetic, numeric, and other nomenclature, as well as for function keys. However, the functions assigned to the function keys are typically dependent on the computing context and are oftentimes assigned different functions for different contexts.

[0002] The ability to provide more flexibility in manufacturing and among the many different users was addressed by putting small liquid crystal display (LCD) screens on the tops of the individual keys. However, this presents many new problems by providing each of the keys with the LCD screen, LCD driver, LCD controller, and electronics board to integrate these components. Moreover, electronics boards need to be placed at the top of each of the mechanically actuated keys and connected to a system data bus via a flexible cable to accommodate the electrical connection during key travel.

[0003] Additionally, each of the keys must be individually addressed by a master controller to provide the electrical signals for controlling the LCD images for each of the key tops where the image is formed. This additional complexity impedes the mass production capability and low cost desired in a highly competitive marketplace. The LCD screens are flat, thereby preventing the design of concave or otherwise shaped keypads to provide tactile feedback to the user.

SUMMARY

[0004] The following presents a simplified summary in order to provide a basic understanding of some novel embodiments described herein. This summary is not an extensive overview, and it is not intended to identify key/critical elements or to delineate the scope thereof. Its sole purpose is to present some concepts in a simplified form as a prelude to the more detailed description that is presented later.

[0005] Disclosed is a mechanical architecture for providing maximum viewing area on the key button tops for the display of information, and with a tactile sense similar to standard laptop keyboards, all using low cost manufacturing methods such as injection molding. The architecture optimizes the aperture through the core of the key switch assembly in order to project an image through the aperture and onto the display area of the key button. The architecture moves the tactile feedback mechanism (e.g., dome assembly) out from underneath the key button to the perimeter or side of the key switch assembly.

[0006] The mechanical architecture finds particular application to input devices such as keyboards, game pods, data entry devices, etc., that operate in combination with an optical surface (e.g., wedge lens). The mechanics can include a movement assembly such as a scissor key structure or a hollow key stem silo structure, and a window (display area) in the top of the key button where the display area receives light transmitted up from the optical surface between the movement assemblies.

[0007] Additionally, the architecture includes a key activation mechanism (e.g., key-down detection) that can be an optically sensed rigid post attached to the key button, an optically sensed marker on the bottom of dome assembly, or an electro-mechanical solution that includes a multi-layer plastic sheet (e.g., polyester) with contact key switches. Tactile feedback can be provided using a single rubber dome assembly per key, where the dome assembly is offset for scissor key structures. The dome assemblies can also be mass produced on a dome sheet for multiple keys. Other alternative approaches to an elastomeric dome for providing tactile feedback are possible such as by using a movable shock absorber between the scissor assembly legs, bulk solid compression or, metal or plastic spring, for example. Wire anti-sway bars can be provided to prevent key twist on large keys (e.g., space bar, enter, caps lock, etc.). The architecture also includes a sealing structure that prevents debris, liquids, oil, etc., from entering the key and display area, and seals individual keys.

[0008] The use of the display of information (e.g., characters) on the key buttons offers flexibility such as legend morphing, and general display through the keys. The key switch mechanism facilitates the enhanced display capability, and detects touch to the display surface thereby enabling gestures on the display surface. Extending gesturing further, the keyset may be temporarily removed or entirely eliminated in order to gesture directly on a full-keyboard sized display surface.

[0009] To the accomplishment of the foregoing and related ends, certain illustrative aspects are described herein in connection with the following description and the annexed drawings. These aspects are indicative of the various ways in which the principles disclosed herein can be practiced, all aspects and equivalents of which are intended to be within the scope of the claimed subject matter. Other advantages and novel features will become apparent from the following detailed description when considered in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. **1** illustrates a key switch assembly for display-type keys for user input devices.

[0011] FIG. **2** is a side view of an exemplary scissor-type key switch assembly in an up key position view and a down key position view.

[0012] FIG. **3** is an oblique view of an alternative silo switch assembly that employs a silo-stem arrangement with external dome.

[0013] FIG. **4** is an oblique cross-sectional view of the silo switch assembly of FIG. **3**.

[0014] FIG. **5** is an oblique cut-away view of an alternative silo switch assembly.

[0015] FIG. **6** is a side view of an alternative switch assembly in an up position that employs an optical paddle for position detection.

[0016] FIG. **7** is a side view of the alternative switch assembly in a down position where the optical paddle surface is in contact with the optical surface for position detection.

[0017] FIG. **8** is an oblique view of an alternative switch assembly in an up position and that employs the optical paddle as part of the scissor assembly.

[0018] FIG. **9** is an oblique view of the alternative switch assembly in a down position and that employs the optical paddle as part of the scissor assembly.

[0019] FIG. **10** is an oblique view that shows the optical paddle and an associated scissor member.

[0020] FIG. **11** is a cross section view of a sealing film when an underlying key switch assembly is in a key button up position.